Salvaging Some Equipment

New Uses for Low-Energy Accelerators. Prepared by the ad hoc panel of the Committee on Nuclear Science of the National Research Council. National Academy of Sciences, Washington, D.C., 1968 (available for limited distribution from the Physics Section, National Science Foundation, Washington, D.C.). x + 174 pp., illus. Paper.

Low-energy accelerators of protons and heavier ions have served science well. In the four decades of their use, light-element nuclear physics, for which they were intended, has had thorough and imaginative investigation. In the process generations of scientists have been trained and instrumentation has been developed that has aided many fields.

Consequently, in the United States alone, over 112 low-energy accelerators of 6-Mev energy or less are now in operation. An indefinitely long continuation of this same service can hardly be expected for all of these accelerators. The higher-energy tandem Van de Graaff accelerators in operation during the last decade allow the same precision measurements, but for all elements and to higher states of nuclear excitation. In the present competition for accelerator operating funds, low-energy accelerators therefore face an uncertain future.

Certainly these valued instruments deserve a more respectable future than to serve primarily as demonstrations of capital-equipment posession. Fortunately, rescue has come through a deliberate effort by a blue-ribbon group of American scientists led by William A. Fowler of the California Institute of Technology.

The resulting report, *New Uses for Low-Energy Accelerators*, is a splendid solution. The book reviews several fields of investigation, most of them excitingly new, in which the accelerators might be used. These are not merely experiments desirable to do. Instead they are whole fields for exploration, analogous to the nuclear physics for which these accelerators were built.

What are these means to the salvation of low-energy accelerators? One is nuclear astrophysics, in which the previous nuclear physics efforts are redirected to measurement of those particular reactions involved in stellar processes. The others are in a category now called atomic-collision physics. One is the venerable atomic spectroscopy, but with an accelerator-based technique promising to revolutionize the field. The other is the study of solids, particularly crystalline solids, by the use of accelerated particles to alter the solids or to provide probes of unprecedented sensitivity. Contained in these fields are surely many of the basic science discoveries of the future, many industrial applications, and the training of a new generation of scientists able to serve in these blossoming areas.

Not only does the report justify the importance of these new fields for low-energy accelerator research, it provides easy-to-follow instructions on how to become quickly productive on the frontiers (at the 1967–68 writing) of these fields. In each field, an unusual—and pleasing—combination of information is provided. First is a scholarly summary of the field including impressive bibliographies. Next is an apparently complete disclosure of precious information, items the experts believe should be investigated. (The authors are so considerate that they even caution when a certain area is too complex for neophytes.) Finally, a time- and effort-saving list of sources for unusual needed equipment is given.

Enthusiastic scientific endorsement of these new fields is readily found, even aside from the apparent need for a redirection of much of the low-energy accelerator effort away from traditional nuclear physics. Astrophysics appears destined for an unusually large expansion of effort; surely experimental nuclear astrophysics at accelerators will similarly increase even though much has already been measured. In only the first few years of optical spectroscopy at accelerators, discoveries have already been made that rival the near-century of traditional non-accelerator spectroscopy—and with confusion about impurities now eliminated. The quietly increasing attention of industry to the use of accelerated particles in materials science is evidence of the importance of low-energy accelerators to solid-state physics.

On almost all counts, this report is more valuable than the several recently published proceedings of conferences on related subjects. Obviously, a panel can provide more of value than a mere collection of individual contributions. (Not citing individual authorships seems to be overdoing the public-service aspect of this report, however.) To cite still another merit, note that this report is provided in limited number to the needy as a courtesy of the National Science Foundation.

This report deserves to be a manual for a new era for low-energy accelerators, whose devotees might otherwise fall behind the general scientific advance.

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Petrology

Recent Developments in Carbonate Sedimentology in Central Europe. A seminar, Heidelberg, July 1967. G. MÜLLER and G. M. FRIEDMAN, Eds. Springer-Verlag, New York, 1968. viii + 256 pp., illus. $14.50.

A total of 30 papers, all in English, are grouped into five sections, although the last section, Applied Carbonate Petrology, consists of a single brief paper on gasometric determinations used for comparative analysis of drill cuttings. A sample of the diverse types of deposits under investigation can be seen in reports of the studies of Schöttle and Müller on the Recent freshwater carbonates of Lake Constance, Matter on the Ordovician tidal flat deposits of western Maryland (U.S.A.), Füchtbauer on the Zechstein Basin, and W. E. Krumbein on the Nari-Lime Crust of Israel, all under the heading Regional Carbonate Petrology.

The section on geochemistry includes among others an article on calcium-magnesium distribution in the Lower Keuper, northwest Germany (Marschner) and one on the strontium content of recent and fossil limestones (Bausch), which tend to be discussions reevaluating previous data and theories in the light of local considerations. One of the few reviews is a paper by Flügel *et al.* on electron microscope studies of limestones in the section Microtexture and Microporosity of Carbonate Rocks. The authors imply that diagenetic processes may be recognized by such studies. An annotated bibliography of recent contributions utilizing the electron microscope is included at the end of the paper.

The section Processes of Carbonate Formation and Diagenesis includes an interesting discussion of the formation of ooids and other aragonite fabrics in warm seas by Bathurst. Lippmann again discusses the low-temperature synthesis of norsethite, BaMg (CO_3), with dolomite-type structure. However,

Usdowski classifies dolomite formation in sediments as early or late diagenetic, both mechanisms reacting on a previously formed $CaCO_3$. Experimental compaction of natural carbonate sediments (Ebhardt) and a classification of stylolites by Park and Schot illustrate other schools of European investigation. About the only major investigative field not included is that of isotopes.

The volume makes no attempt to be exhaustive, but it lives up to the title as an interesting progress report.

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Human Adaptability Project

Human Biology. A Guide to Field Methods. J. S. WEINER and J. A. LOURIE, Eds. Published for the International Biological Programme by Davis, Philadelphia, 1969. xxxvi + 624 pp., illus. Paper, $17.50. IBP Handbook No. 9.

This book is the second volume in the handbook series of the International Biological Programme to be concerned with the Human Adaptability Project of the program. In Handbook No. 1, also edited by Weiner and first published in 1965 (second edition, Davis, 1969, $3), the goals of the Human Adaptability Project were described and the general method was justified. In the present book the specific techniques to be used in the Project components are described.

The 50 separate procedures described in the book cover seven topical areas appropriate to research on human adaptability. These are: growth and physique, genetic constitution, work capacity and pulmonary function, climatic tolerance, nutrition, medical and metabolic studies, demography and related sociocultural factors, and finally environmental description. As stated in the introduction to this volume, a primary consideration in the selection of each procedure was its suitability for field conditions. Weiner and Lourie also state that the procedures are the distillate of the efforts of over 100 contributors and have been subjected to evaluation and testing by a series of working parties and conferences. The results of these various working parties and conferences have also been published in various other pamphlets and books which provide valuable supplements to the present volume.

The descriptions of techniques vary considerably in detail and depth. Techniques for assessing physiology, growth, and some genetic systems are described in sufficient detail that any human biologist with modest training could carry out the prescribed tests. In other subjects, particularly in the medical and sociocultural areas, the sections provide at best a framework for the development of appropriate methods. Certainly the variation in quality suggests that both the interests of the original planners of the Human Adaptability Project and the effort devoted to field testing strongly affected the quality of the resulting technique descriptions.

Judging by the original time table of the International Biological Programme this book has appeared decidedly too late to serve its avowed purpose of providing techniques for IBP researchers. The IBP finished its planning stage in 1967 and is scheduled to finish the research program in 1972. However, it has been clear from the beginning that the human adaptability proposals called in essence for a whole new scientific discipline. Plagued by a worldwide shortage of funds for research, the program has been slow to progress. Nevertheless, the pilot projects have been highly productive, and it appears that a new concept of human biological research will emerge from the program. For those who are interested in a preview of what this discipline will contain, Handbook No. 1 and the present one are highly recommended.

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Steroids and Gonadotropins

The Gonads. KENNETH W. MCKERNS, Ed. Appleton-Century-Crofts, New York, 1969. xviii + 794 pp., illus. $45. Biochemical Endocrinology, vol. 2.

This volume consists of papers originally presented at a symposium on gonadal function. It is not, therefore, an integrated presentation of gonadal endocrinology in general. Rather, authors were chosen whose work represents important contributions over a wide range of our current knowledge. The interplay of various views is brought out by the inclusion of portions of the accompanying discussion. According to the editor "the guiding principle was not only the presentation of the latest research but also a comprehensive approach to the basic problems in the field of the investigator's interest with a survey of the development of the ideas leading to his current concepts and plans for future research." The more general goals have been met in widely different degrees by the different authors. The papers vary from brief introductory paragraphs followed by presentation of the author's work in the usual symposium form to accounts that truly integrate the author's results with the field as a whole.

The various experimental techniques used in the study of steroid biosynthesis in the ovaries and its control by gonadotropins are well represented, as is evidence for different views of the mechanisms of gonadotropic action. The reader therefore has an opportunity to evaluate the conclusions reached. The mechanisms by which gonadotropic levels are controlled are not considered, however.

The broad range of approaches and their current uses are illustrated by the inclusion of two chapters on luteolysis, another by Channing presenting a summary of her studies on cultures of different types of ovarian cells, and one by Christensen and Gillim dealing with the ultramicroscopic structure of the steroid-secreting cells of the ovary and testis. Christensen and Gillim's chapter also constitutes an admirable general review of the relation of various organelles to function and forecasts future developments.

The portion of the volume discussing the testis is more limited than that devoted to the ovary but, again, both in vivo and in vitro methods of study are well represented. This section contains, in addition to papers on androgen biosynthesis and its control, a chapter on fluid dynamics in the testis, and the Steinbergers contribute an excellent chapter on spermatogenesis. One wishes that papers on the physiology of fertilization had been included.

In summary, this book will bring the reader in touch with some of the best current work on gonadal function. It is not comprehensive; some leading workers and their contributions are not represented. It is, however, a valuable source of knowledge, and scientists whose work impinges on this field will find it a valuable addition to their libraries.

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